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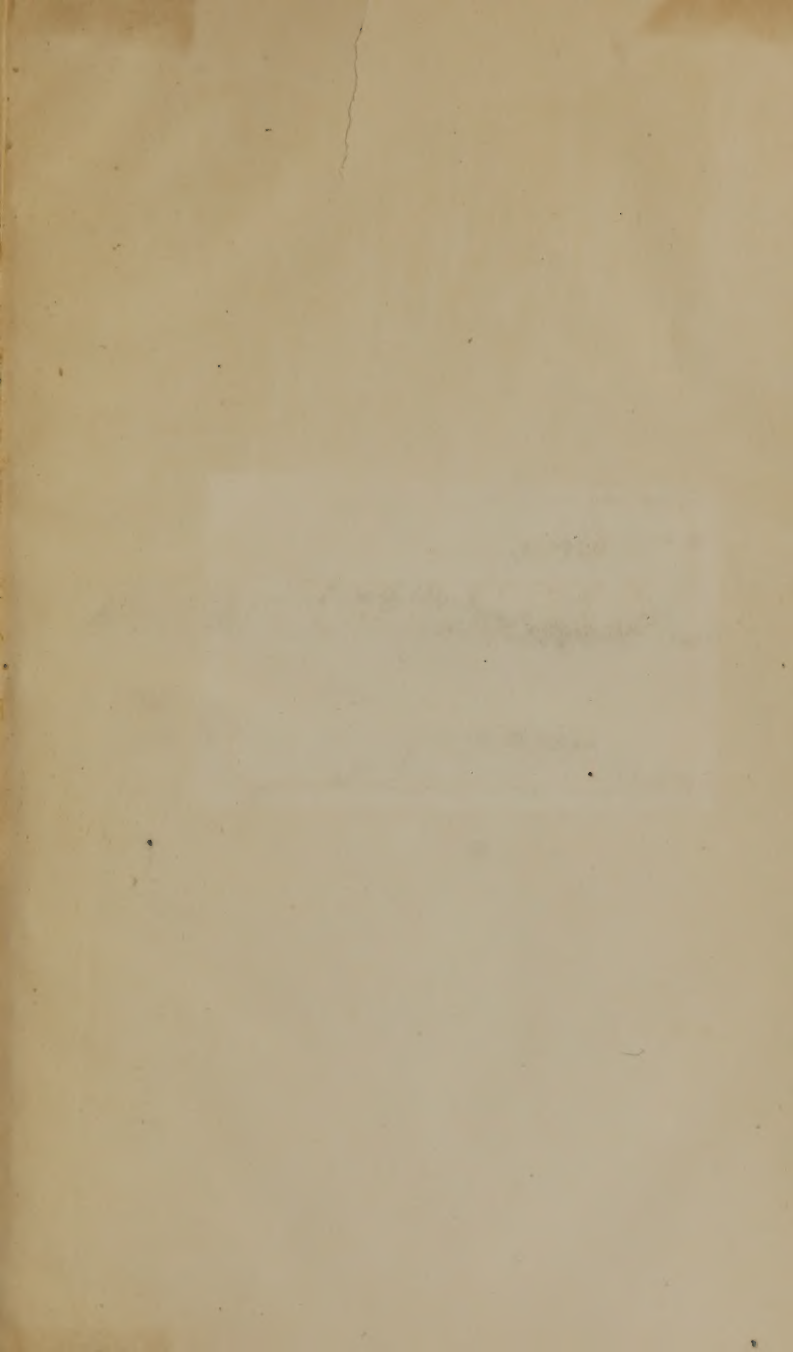


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ADVANTAGES OF CHEMISTRY:

OR,

AN INTRODUCTORY ADDRESS,

DELIVERED IN THE

CHEMICAL THEATRE OF JEFFERSON MEDICAL COLLEGE.

AT THE

Opening of the Session of 1834-5.

✓
BY JACOB GREEN, M. D.

PROFESSOR OF CHEMISTRY IN JEFFERSON MEDICAL COLLEGE.

PUBLISHED BY THE MEMBERS OF THE CLASS.

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Washington, D.C.
Philadelphia:

WILLIAM BROWN, PRINTER.

1834.

ALL LETTERS OF CEMENT

AN INDEPENDENT ADDRESS

BY JAMES M. SMITH

DELIVERED AT THE ANNUAL MEETING OF THE

1834

OF THE AMERICAN CHURCH

BY JAMES M. SMITH

DELIVERED AT THE ANNUAL MEETING OF THE

Annex

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WILLIAM SMITH

1834

PREFACE.

No one can be more fully persuaded than myself of the justice of the remark which I first heard from my distinguished colleague Professor PATTISON, "that no discourse prepared for a popular audience should ever be published." There are, however, many reasons which often induce us to depart from a path, which our own prudence and judgment may have inclined us to follow. Whether the desire to comply with the unexpected request contained in the following letter, will be considered as a sufficient apology, for violating the above axiom, I must leave to those who have been placed in like circumstances to determine.

Jefferson Medical College, Nov. 23d, 1834.

DEAR SIR,

At a late meeting of the undergraduates of Jefferson Medical College, held on the 22d inst., it was proposed and unanimously adopted, that a copy of your very eloquent lecture, introductory to the session of 1834-5, be requested for publication.

We, a committee appointed for that purpose, under the influence of the most unaffected feelings of respect for an esteemed Professor, take great pleasure in presenting you the decision of the class, while at the same time we warmly acquiesce in their earnest solicitation.

With regard and esteem,

We have the honour to be,

Yours, &c.

N. B. CLOUD, So. Ca.

N. C. SINQUET, Philad'a.

THOMAS PENISTON, Ala.

JNO. McCLELLAN, Ct.

G. A. WILLIAMS, Va.

To Dr. JACOB GREEN.

To the above letter the following reply was returned.

Philadelphia, Nov. 25th, 1834.

GENTLEMEN,

I accede to your request in behalf of the Medical Class of Jefferson College, for the publication of my Introductory Lecture with the mingled emotions of pleasure and regret. It would be worse than folly not to acknowledge great gratification in having performed the first and most arduous duty in my present course of lectures, in such a manner as to excite in you a desire to have it recalled, through the medium of the press, when distance and time may separate us from each other. My regret arises from a conviction that your partialities have invested the address with an interest and a merit which it does not deserve. Every lecture which can fairly be called an introduction to a series of discourses in any department of knowledge, must necessarily consist of the facts connected with its history; and these facts, if the science be as ancient as that of chemistry, must be derived from the writings of others; you will therefore realize how small a tribute of praise can be due to me for collecting and grouping the details of

my discourse. But such as it is, gentlemen, it is entirely at your service.

Should the perusal of the address, stimulate any member of the class to vigorous efforts in the boundless field of enquiry which it opens to the view; or should it bring back to any one, in after time, some pleasing reminiscence of the hours of pupillage, and of scenes associated with college life, it will not have been published altogether in vain.

With the warmest feelings of kindness and attachment to yourselves, individually, and to every other member of my class,

I remain, most truly, yours,

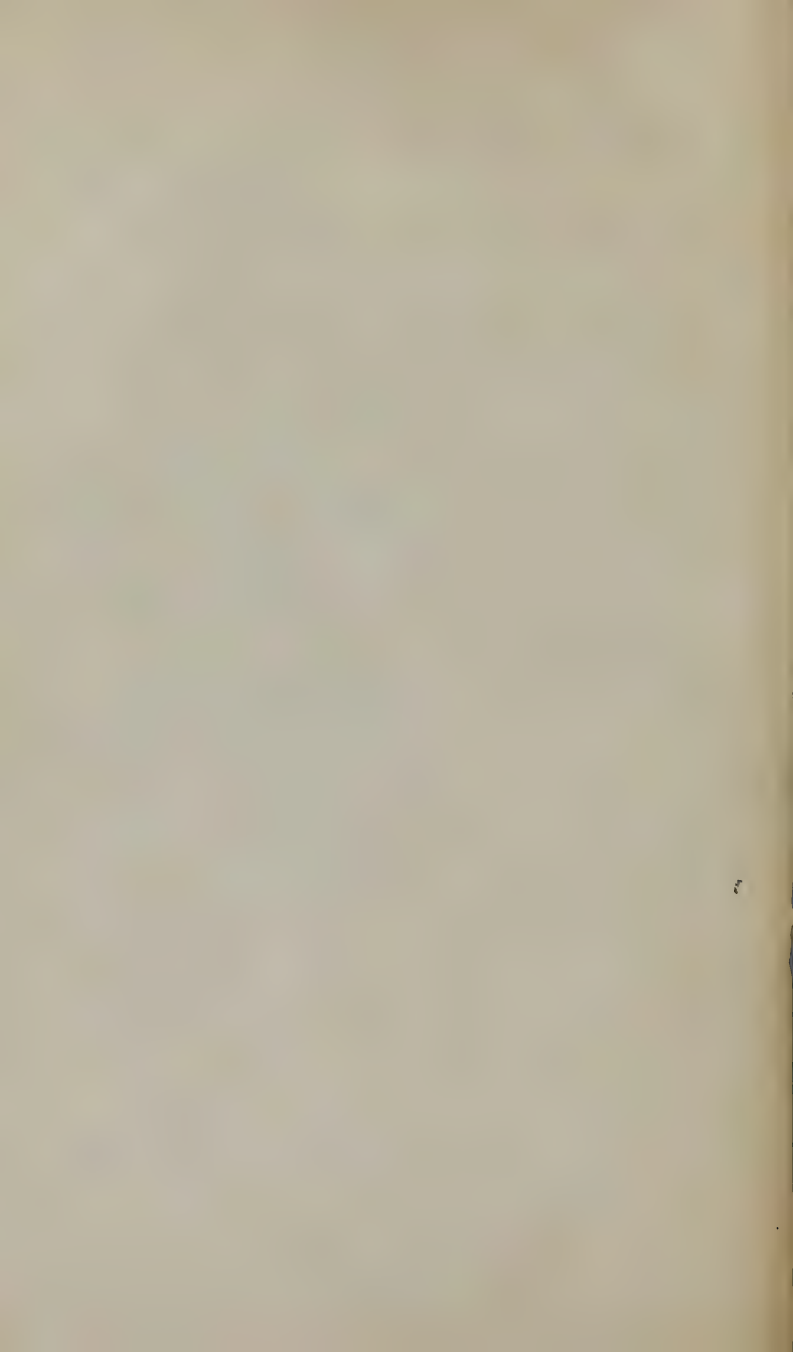
JACOB GREEN.

To Messrs. N. B. CLOUD,
N. C. SINGUET,
THOS. PENISTON,
JOHN McCLELLAN,
G. A. WILLIAMS,

Committee of the Medical class attending the Chemical Lectures in Jefferson College, during the session of 1834-5.

ADVERTISEMENT.

IT is a usage with the Faculty of Jefferson Medical College, to appoint one of their number to open the annual course of Lectures, with some general remarks preparatory to the ordinary routine of the Introductory Addresses to the several departments of Medical Science, taught in the Institution. In commencing the present term of the College, this duty devolved on the writer. This is mentioned to explain the nature of the few observations, which precede the discourse on some of the advantages derived from Chemical pursuits.



INTRODUCTORY ADDRESS.

GENTLEMEN,

Assembled as we are at present to commence a series of mutual labours, the duties and obligations which rest upon the teacher and the pupil, should now rise in the mind in all their freshness and reality. In behalf of my colleagues I can assure you that it is our fixed determination and anxious desire, to promote your advancement in Medical knowledge, by the most unwearied personal efforts,—by the use of all those facilities which the ingenuity of art has devised for our assistance,—and by every means in our power which Nature herself can furnish.

You, too, gentlemen, are beginning a course of Lectures which, if punctually and diligently pursued, will insure those attainments, which cannot fail to make you useful and distinguished in the profession which you have chosen. It is not, perhaps, too much to say, that on your improvement or neglect of the opportunities which you now have in your offer, may depend the most important consequences to yourselves,

and the most interesting results to the community at large.

Before I commence the introductory address to the science which it is my business and pleasure here to teach, allow me just to say a word in favour of the institution with which most of us are connected.

It is my fortune to have been attached to the College from its first organization. I am familiar with the views and objects entertained by its patrons at its very foundation. I have been constantly behind the scenes, and have examined every wheel and spring, and impulse, by which it has been moved. I have watched with deep and peculiar interest, the various changes as they have occurred; and whatever may be the opinion of those who have looked on, at a distance, or who have only seen the results of our efforts; be assured, gentlemen, that no merely selfish considerations, or mercenary views, have ever governed our operations. Right or wrong in their consequences, all our movements have been prompted by a desire to promote the true interests of science, and to advance the dignity and honour of the Medical profession.

Having said thus much for the past, may I not now congratulate our friends on the present flourishing state of the Institution. Through the difficulties and discouragements, which always impede the progress of important undertakings, we have pushed forward

with a steady step—with accelerated vigor and success—to our present elevated position. There is no one, friend or foe, who will hesitate to pronounce, that the prospect before us is, in the highest degree gratifying to our most sanguine anticipations. Our College was founded with enlightened, liberal, and exalted views of Medical science; it has been maintained, as far as our exertions could maintain it, in the true spirit of scientific zeal and enterprise;—all its duties have, we believe, been efficiently, faithfully, and fearlessly discharged; and I hope I do not use the language of boasting, when I assert that our present character and usefulness will justify the best anticipations of its patrons and founders, for the future. I might here enter into those details of our history, which would abundantly confirm the statements and assertions just made, but their best demonstration and our highest eulogy will be found in the character and fame of the Alumni of the institution. With heartfelt exultation, we could readily point to many a distinguished individual who will acknowledge that here he first imbibed correct theoretical sentiments in science; that here, he was first instructed in the sound principles and judicious practice of the healing art; that here, within these walls, he was first taught how best to perform his part in the great, the varied, and the solemn business of his professional life, and who,

with gratitude and pride, now points to Jefferson Medical College as his *Alma Mater*.

Alive to feelings awakened by a recollection of the past—sensible of the high and responsible duties which, at this moment, press upon us, and animated by the cheering prospect of extensive usefulness which opens before us—we offer to you all, gentlemen, our warm and cordial *salutations*.

ADVANTAGES OF CHEMISTRY, &c.

IN our introductory lecture delivered last year in this Hall, we drew an outline of the history of the origin and progress of chemistry. It was then shown, that the vain and delusive researches after the philosopher's stone, which, by its magic power, should be able to convert all the baser metals into gold, and also the discovery of an elixir of life, or universal medicine, which should prevent or remove all disease; first directed the attention of philosophers to those facts which afterward laid the foundation of modern chemistry.

We propose at this time to call your attention to some of the sciences and the arts with which chemistry is intimately connected, in order to give you some idea of its relative value and importance. The field of inquiry which we are now to explore, you will readily perceive is too extensive in its bearings, and too various in its productions, to admit of any remote speculation, or of much minute inquiry. Let not therefore those details be expected which are inconsistent with the conciseness of our plan.

No science is so intimately associated with all the pursuits of man, or mingles so extensively with all his occupations as that of

chemistry. It embraces the whole range of created nature, comprehending in its researches every animate and every unorganized substance. It explores the elementary principles of things, unfolds their combinations, and ascertains or traces their various affinities. In every employment of life, therefore, we feel its influence, or stand in need of its aid.*

We shall first notice its connection with medicine. The physician and the chemist have generally been considered identical. At the first dawning of our science, and even during the gloomy period of Alchemical delusion, it was cultivated almost exclusively by physicians,—who then considered it a high and sacred art—an art proper to be known and practised, only by the pure—the benevolent—the learned, and the wise. That the art of applying remedies to remove the diseases which are incident to our nature, should derive incalculable benefit from an alliance with chemical knowledge can surprise no one; and it may be confidently predicted that the advantages will increase with the progress of our science. How, indeed, should this be otherwise, since every living animal body is, in truth, a perfect and exquisitely contrived laboratory, in which chemical operations are continually going on—obeying the

* See the eloquent address of the late Dr. S. Elliott before the Literary and Philosophical Society at Charleston, S. C. for some admirable remarks on this subject. To this address I am indebted for many valuable hints.

same laws, and producing similar results to those which occur in our ordinary experiments. We know that there are some exceptions to this general statement. It is true that substances received into the animal system, are converted into its nutriment by a process which is frequently modified or altered, by the vital powers ; yet the process itself is still essentially chemical. That series of changes by which every variety of dissimilar food is converted into blood, a fluid of comparatively uniform composition and quality, the action of the air on this fluid as it passes through the lungs, and the numerous and important alterations which it undergoes, throughout its living circulation, are all the exclusive and legitimate subjects of chemical inquiry.

Again, the chemist, by analysing the animal fluids and solids, is often enabled, not only to throw considerable light on the interesting researches of the physiologist, but in many cases to assist the practical inquiries of the physician.

In certain calculary diseases, a considerable knowledge of chemistry is absolutely essential, and the first rational views relating to the cure of such diseases, were given by an eminent chemist. If we except Scheele's original observations on lithic acid, all the useful discoveries on this subject are due to the late Dr. Woollaston ; discoveries so curious and important that they are alone sufficient to entitle him to the admiration and gratitude of mankind.

We may also mention, in this place, the advantageous use of certain acid fumigations in cases of infection. During a dreadfully contagious disease, which spread havoc and desolation through many parts of Spain, the inhabitants of those houses, in which these fumigations were used, escaped the attacks of sickness, and enjoyed perfect health. The infected cathedral of Dijon purified by the preserving phials of Morveau, the celebrated liquor of the four thieves of Marseilles, who pillaged that unfortunate city, when ravaged by the plague, and the neutralization of miasmatic exhalations by certain mineral substances, will all be detailed on another occasion.

To the study of physiology, chemistry has of late years been applied with the most flattering success. It must be confessed, however, that this connection has given rise to many visionary and seductive conjectures; and, in our opinion, to some pernicious theories; yet, even these circumstances have not been altogether without advantage; for they have, by exciting doubt in the minds of ingenious and diligent men, led to new and more accurate investigations. A reproach, to a certain degree just, as Davy happily remarks, has been thrown upon those doctrines which are called by the name of Chemical Physiology, for in the application of them, speculative philosophers, instead of endeavouring slowly and with cautious hands to lift up the mysterious veil which conceals the wonderful phenomena

of living nature, have vainly, rudely, and presumptuously endeavoured to tear it asunder.

The importance of Chemistry in the *Materia Medica* and Pharmacy, no one, in the smallest degree acquainted with these subjects can, for a moment, doubt: indeed it was the intimate connection which naturally subsists between them, which first led the priests of Egypt, who were the physicians of the country, to study Alchemy, in order that they might become acquainted with the art of preparing and compounding their own medicines. It was the same idea which induced the Alchemists to incorporate the discovery of an elixir of life, with the search after the philosopher's stone, they imagined that the same agent which would convert the baser metals into gold, would by its operation on the animal system, remove all its diseases.

One important advantage derived from the application of chemistry to the *Materia Medica*, is, that it furnishes the practitioner with the only means of discovering the quality or genuineness of most of the articles which he employs. It is not to be expected that he will analyze every substance he prescribes. It not unfrequently happens, however, that a prescription fails to produce the desired result, in consequence of having lost its energy by age or by reason of fraudulent admixture; here a drop of acid, or some other well chosen test, will ascertain its purity, or detect its adulteration.

Many a practitioner, unacquainted with the general laws of our science, may recollect some very painful disappointment, or some very unexpected result, when two or more remedies have been administered together. A slight knowledge of chemistry would have informed him, that many formulæ of the pharmacopias, efficacious and salutary in themselves, are rendered wholly inert, if not pernicious and destructive, when given in conjunction with certain other substances. The chemical affinities, therefore, which subsist between various medicines and articles of diet, are of the utmost importance to be understood. We very well know, as already hinted, that there are certain powers of the animal economy which often counteract and modify chemical affinity, and that the operation of substances on each other in the laboratory, is not always precisely analagous to that which takes place in the living system; yet a certain just professional confidence in the application of remedies can only be acquired, by the cultivation of chemical science; if every inspiration of the lungs, and every throb of the heart, produces an important chemical change in the vital fluids, what must be the effect of powerful agents when ignorantly and liberally introduced into the system itself.

The study of Medical Jurisprudence, now deservedly held in high estimation, is grounded on a knowledge of chemical analysis; for without its aid, it would be impossible to comprehend in any degree

the nature of animal, mineral, or vegetable poisons. Many thousand lives have been lost by these active agents, which might in all probability have been saved, by the advice of the well instructed and skillful physician. The operation of many poisons on the system is now well understood, and it only requires a moderate acquaintance with our science, to enable the practitioner to administer the proper antidotes. As some mineral substances act with sudden and violent energy on the vital powers, they are too often unhappily resorted to as the instruments of suicide and murder. In such cases, the physician is frequently summoned to appear in a court of justice, to give in his evidence, and to state the facts upon which he grounds his belief, that poison has been employed. It is, therefore, of the highest importance that he should be possessed of the knowledge necessary to detect its presence, and to form an opinion from circumstances less equivocal than mere symptoms: this knowledge, as it consists in the application of proper chemical tests, can only be acquired by some attention to chemical principles. The poisons which can be detected with the greatest certainty, are those of the mineral kingdom; and so infallible is the chemist, often in ascertaining whether death has been produced by these causes, that the assassin now resorts with the hope of eluding suspicion to those of vegetable origin as more subtle in their nature, and not so easily identified as the others. Several experiments have been made on poisons,

with a view to ascertain what substances unite with these deadly qualities, the treachery of leaving no trace of their operation. You all recollect the story of the famous woman at Rome, whose skill was reported to be such, that she could poison whom she pleased without leaving a vestige of the means by which she effected her murderous purpose. Since the diffusion of chemical knowledge, all such abominable contrivances have been detected, and all such base hopes are found to be vain. The case of Dr. Castang, who was tried and executed at Paris a few years since, for one of the most diabolical murders on record, will illustrate and close this part of our subject. Castang was the intimate and professed friend and medical adviser of two amiable brothers residing at Paris, brought up to the study of the law;—they both died within a short period of each other, while under his care. By the death of the first, the second brother acquired all his wealth; and upon his demise, Castang became heir to the whole estate. It will be unnecessary to enter into the details of this horrid affair. Suffice it to say, that suspicions allighting upon Castang, he was found guilty of murder by administering doses of emetic, and the acetate of morphia. Having free access to his unsuspecting victims, he gave the insidious poison in small disguised portions; thus keeping his miserable patients constantly sick, until death terminated his horrible devices. We might here enter into further particulars, and show the use of

chemistry as applied to several other branches of medical science; but we hasten to consider its importance to the mineralogist.

Mineralogy received but little attention from the ancients. Agricola, a miner of Saxony, who was the first scientific mineralogist; described a great variety of minerals, and arranged them according to their external characters; but, after his time, the subject fell into neglect, and was, for a long time, abandoned to the ignorant and designing. When chemistry began to be generally cultivated, mineralogy again revived. The celebrated Becher, who may be said, first to have introduced the ingenious theory of phlogiston into chemistry, was the first to apply chemistry to the science of mineralogy—proposing to describe minerals, and to classify them according to their composition. The rude and imperfect attempts at analysis, practised by the early chemists, shed great light on this subject; and we have even now to lament, that we cannot identify with precision, the objects of their examination. Notwithstanding the early and promising endeavours at a system of chemical mineralogy, this natural mode of arrangement was superceded by two ingenious systems of classification; the leading principles of which were to associate in groups or families such minerals as Nature herself appears to have connected together, either by their general external appearances, or by their chrystalline structure. We intend nothing disrespectful to the profound and wonderfully ingenious system of the

Abbe Haiiy, or to the scrupulous accuracy and persevering diligence of Professor Werner; but, in our opinion, every system of mineralogy which has not chemical analysis for its basis and superstructure, must eventually fall into disuse. But unlike the poets' baseless fabric of a vision, many an important wreck will be left—marking the spot where the ruin stood, and furnishing useful fragments to succeeding architects. The theories of the natural philosopher, generally, lead to a minuteness of investigations which results in the discovery of some new and curious facts; and these again open new and extensive fields for curious speculation. This method of pursuing truth, by forming a theory and then searching for facts to establish it, is by no means to be recommended—for, like the illusive meteor, it often dances at a distance before the inquirer, and after leading him through many perplexities and embarrassments, it at last vanishes away. Such theorists, in the language of another, may be compared to the first inhabitants of Arcadia, who chased the sun; and after having reached the hill where he seemed to rest, was still beheld at the same distance from them. It may be safely affirmed, that it was not till a very recent period, when the composition of minerals, by chemical analysis, was minutely attended to; that mineralogy has been fairly entitled to take the rank of a science. Now, under its influence, systematic mineralogy gives beautiful order to our knowledge, by enabling us accurately to ascertain, and

lucidly to arrange the various minerals which are known to exist: it brings to our view, although imperfectly, the great natural associations which Nature has produced, and informs us with certainty of those which, in different and in distant countries, have been found useful. We might here speak at length of mineralogy as a practical subject, as one from which we derive many of the comforts and luxuries of domestic life; but we must confine ourselves to a single topic—metalurgy, or the art of extracting and purifying the useful metals.

The working of metals, an art on which the very existence of many other arts depends, is indebted to chemistry for all its modern improvements, and may expect to derive from the further application of its principles, many other advantages of the greatest importance and value. Some rude and unsatisfactory processes of metallizing were known to the civilized nations of antiquity; but all the refinements of this art are comparatively of modern origin. The whole process of assaying by which we are able to appreciate the value of different ores, and to ascertain from the composition of a small fragment, the propriety of working large and extensive strata; the refining of gold and silver; the conversion of iron into steel, and the various combinations of the metals together in different proportions, so as to afford compounds adopted to particular uses; the construction of furnaces, the employment of fluxes, and the conversion of refuse matter, resulting from numerous metallurgical operations,

into useful materials, have all been suggested or improved by an acquaintance with the doctrines of practical chemistry. Forty-two metallic substances are now ascertained, most of which are eminently useful in common life: seven only of these were accurately known to the ancients, and so high a value did the early inhabitants of our earth set upon them, that they gave to the first metallurgists a distinguished place in their rude, corrupt, though exalted, mythology. Comparatively happy for them would it have been, had their idolatry been always confined to such real benefactors.*

*Inventas aut qui vitam excoluere per artes
Quique sui memores, alios fecere merendo.*

Our next subject is Agriculture. This may be called the most important of all the arts, and it is one which perhaps is the most susceptible of illimitable improvement, from an alliance with chemical knowledge. Vegetation is little else than a chemical process, and though the causes which affect changes in the nourishment and growth of plants are not altogether under our controul, yet neither are they wholly exempt from it. We already know something of the influence of soil, and of the action of manures; and it is not unreasonable to indulge the expectation that chemistry will still unfold to us further means of applying those agents on which the vegeta-

*See Dr. Ure, on the Metals.

ble nutrition depends ; so that we shall be able, ultimately, to accelerate the process, increase the quantity of product, and to a certain extent change and improve its nature. When land is found to be unproductive, the defect in the soil can only be ascertained by chemical analysis ; and after having thus discovered the cause of its sterility, it may often be readily removed. For instance, is there an excess of siliceous sand, the system of ameliorating must depend on the application of clay or calcareous earth—is there an excess of vegetable matter, it is to be removed by liming and burning—and if there be a deficiency, it must be supplied by manure.* When we consider that every change in the arrangements of matter is connected with the growth and nourishment of plants, the great value of their products are as food, and the manner in which soils are to be rendered fertile by cultivation, we shall not hesitate to assign to agricultural chemistry a high rank among the most important studies of man.

There is an extensive class of arts forming when viewed collectively a great part of the objects of human industry ; these, on a loose and hasty observation, do not seem to present any general principle of dependency or of connection with a knowledge of chemistry ; but they appear to be thus dissented, because we have been accus-

* See, this subject enlarged and illustrated in Davy's *Agricultural Chemistry*.

tomed to attend only to their productions or the results of these processes, which are subservient to widely different purposes. This part of our subject has been called Economical Chemistry. We can only enumerate a few of the arts by way of illustration. The manufacture of glass and the various kinds of pottery and porcelain—the process of making and refining sugar—the preparation of the various kinds of fermented liquors, wines and ardent spirits—the arts of bleaching—dying—tanning—and even painting,—these, and a host of others might be brought forward to show the connection between practical skill and scientific knowledge.*

The elementary principles of organized bodies constituting what is called their proximate principles, are but few in number, and vary in their proportions but little in the numerous species in which they are found. It often happens that when one of the proximate principles fails, another supplies its place, and if it be necessary, we can even create, as it were, the proximate principles which we need, by slightly varying the elementary proportions of some other principle. By this new kind of rational magic the chemist has only to will, and every thing may be changed into any thing—every thing be extracted from any thing. Thus vinegar is made from wood; spermacetti from the flesh of horses; soap from that of fish; ammonia from the

* See Dr. Henry's Introduction to his Elements of Chemistry, where the above hints are enlarged, and successfully enforced.

shreads of cloth; nitric acid from sugar; and sugar from starch. Discoveries and metamorphoses of this kind, bid fair to become one day so numerous that we may at last realize from a philosophical research, all the golden dreams of alchemical visionaries.

Besides the extensive relations which chemistry bears to man, which we hope, we have now shown—besides its multiplied uses, the study of it may be recommended to gentlemen of reflection, leisure, and wealth, on the more humble ground of occupation and amusement. While it gives employment to the understanding, and habits of nice and discriminating observation, it requires a kind of manipulation and bodily exercise which are so necessary to the health, comfort, and the happiness of sedentary men. Again, the pleasure which is experienced in pursuing this interesting science, and even the benefits which result to society from the practical application of its laws, ought to be considered as subordinate to the influence which the cultivation of a knowledge of nature should exert on the moral character. We find every where life, intelligence, and order. We find ourselves surrounded by monuments of immeasurable power—of incomprehensible wisdom, and of unbounded goodness. We survey and examine them, until knowledge is lost in astonishment, and wonder yields to adoration. To whatever height we may ascend in tracing the causes which regulate the system of the world, our views must at last terminate in an uncaused Being, in whom is con-

tered all the beauty and order ; all the wisdom, power and goodness displayed throughout the universe. By thus showing us the Deity in his works, the contemplation of Nature leads to consequences, in the highest degree interesting to intellectual and moral agents. We perceive that the whole is arranged in one great system ; that an uninterrupted chain of connection extends throughout the various classes of beings ; that nothing is quiescent ; that the past has been subservient to the present, as the present will be to the future ; in a word, that all things are in a state of progression, rolling on, and tending to the accomplishment and consummation of some great, some final result.

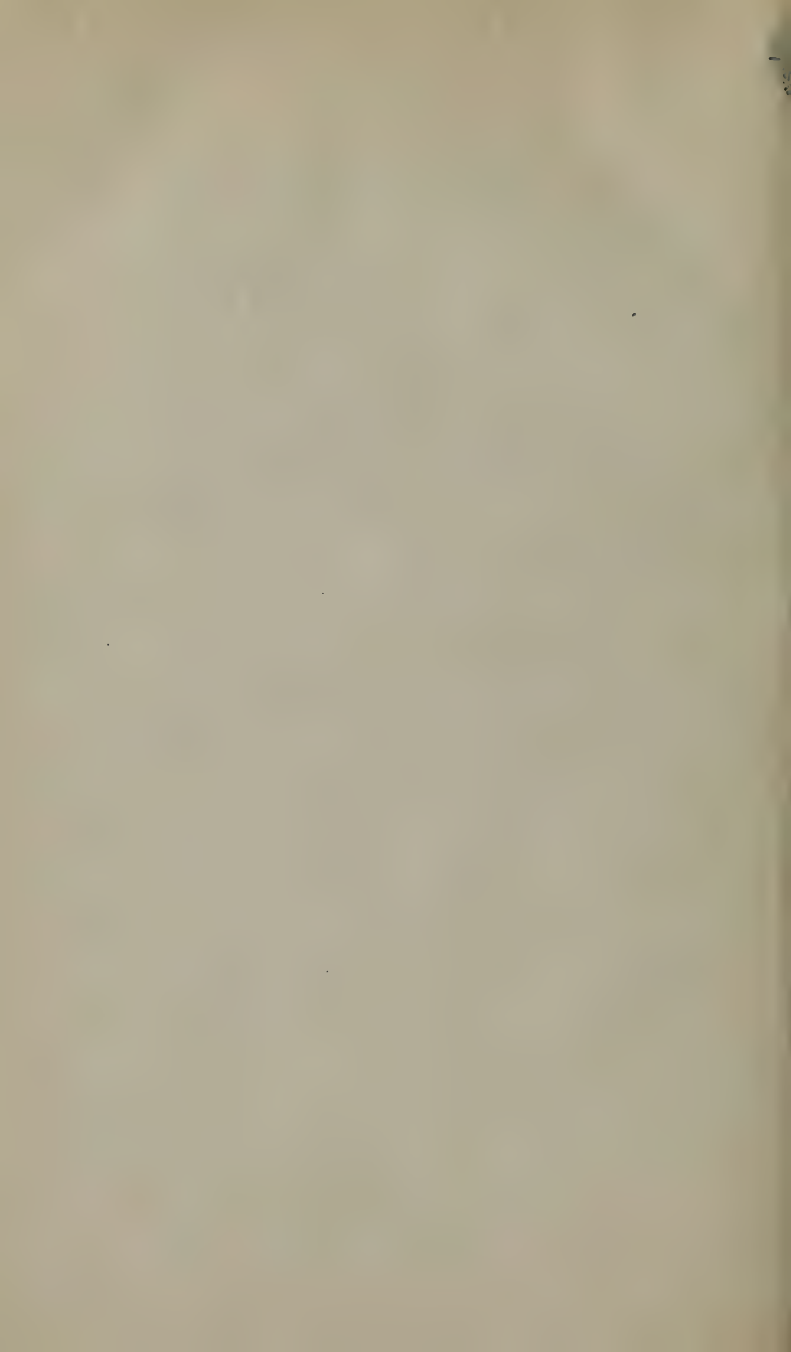
All are but parts of one stupendous whole,
Whose body Nature is, and God the soul—
Which changed thro' all ; is yet in all the same,
Great in the earth as in th' etherial frame.
Warms in the sun—refreshes in the breeze—
Glow's in the stars, and blossoms in the trees ;
Lives thro' all life—extends thro' all extent—
Spreads undivided—operates unspent.
To him no high, no low, no great, no small—
He fills, he bounds, connects, and equals all.

Such, gentlemen, is the very imperfect notice, which the present occasion would permit me to exhibit of the objects embraced by our science. Little more has been given than a faint, broken outline of the whole. From what has been presented, however, you will readily perceive, that there is no human civilized being, whatever may

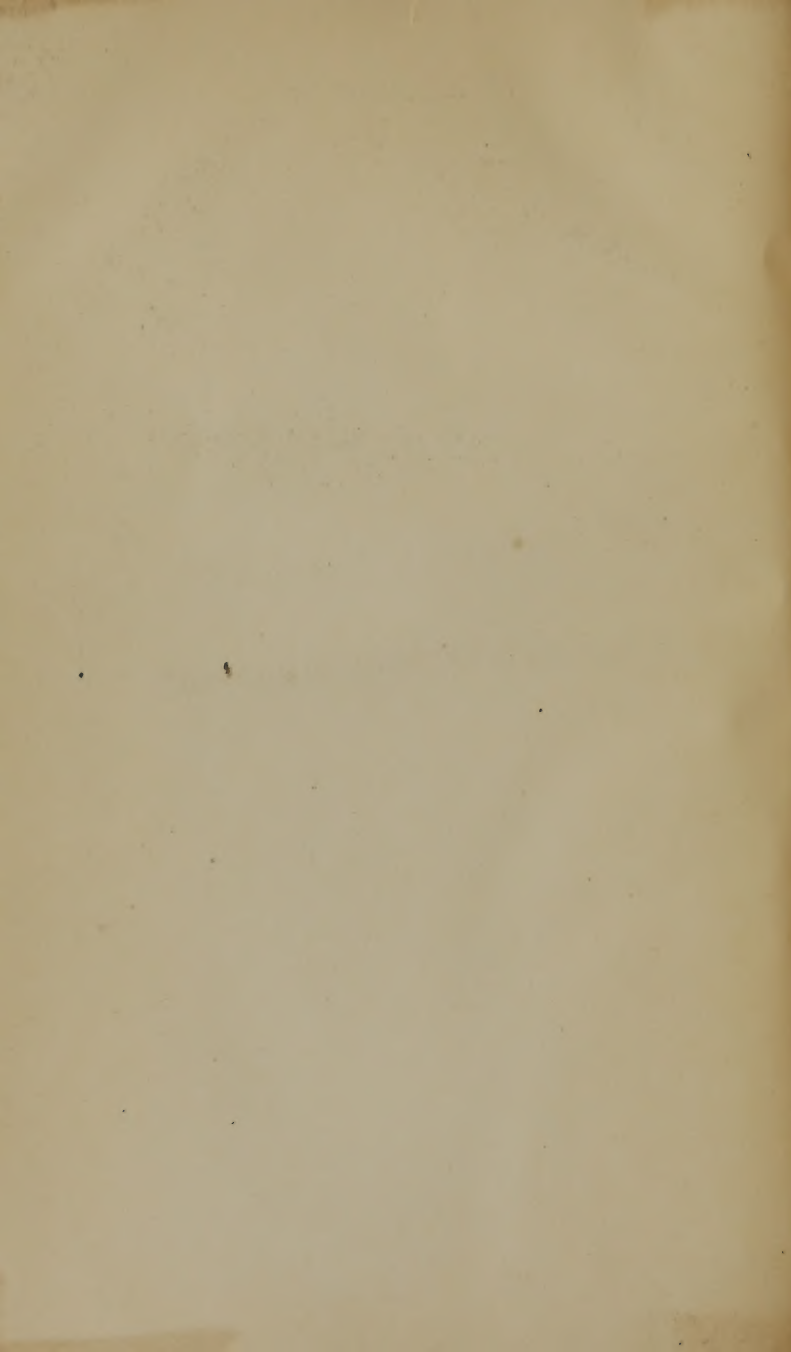
be his condition, his profession, his avocations, or his pursuits, whose interest is not in some degree connected with it. It gives more confidence and value to the practice of the physician—new powers and resources to the man of business and exertion—new skill to the labours of the artist; and new dignity, occupation, and enjoyment to the man of leisure.

It is not from the products of the earth, or from the crude materials with which a country may abound, that her resources must arise; but wealth, power, and usefulness must be sought, by encouraging and pursuing that active, and profound knowledge which ascertains the principles, qualities, combinations and uses of the animal, vegetable, and mineral kingdoms. How important then is it for every community to give to the pursuits of science that encouragement which she requires, and of right demands. Great and almost equal is her influence on national independence—as on personal character. No axiom is more generally true in its individual, and none more certainly true in its national application, than that Knowledge is power. How wonderful and striking the difference between the poor, the rude and wandering savage of our western wilderness, trembling before the elements, depending on his solitary, unaided exertions for food, for shelter, for clothing, and for arms; with the civilized man, who strong in the resources of science and society, rides over the ocean, even on the wings of the tempest, who

directs his course over the pathless expanse by night or by day, with unerring certainty, who disarms the lightning of its power, who subjects the stars to his calculations, fixes the period of their evolutions, measures their distances and estimates their weight, as by a balance, who ascends the airy canopy of heaven, penetrates into the profound recesses of the earth, or plunges into the depths of the sea; who robs disease of half its terrors; makes fire, air, earth and water his ministering servants; "and standing, as it were, on the confines of Nature, seems, as by a talisman, to give energy and life to the very atoms of matter."



PROFESSOR GREEN'S LECTURE.
PHILADELPHIA, 1834.



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